

## FCC REPORT

**Applicant:** Shenzhen Hangshi Technology Co.,Ltd

**Address of Applicant:** Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China

**Manufacturer/Factory:** Shenzhen Hangshi Technology Co., Ltd

**Address of Manufacturer/Factory:** Hangshi Technology Park, Democracy West Industry Area, Shajing Town, Bao'an District, Shenzhen, China

**Equipment Under Test (EUT)**

Product Name: 2.4G Keyboard

Model No: HW126

**FCC ID:** 2AKHJHW126

**Applicable standards:** FCC CFR Title 47 Part 15 Subpart C Section 15.249

**Date of sample receipt:** Aug. 11, 2018

**Date of Test:** Aug. 20-31, 2018

**Date of report issued:** Sep. 03, 2018

**Test Result :** PASS \*

\* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

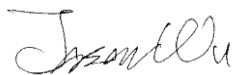
**Robinson Lo**  
**Laboratory Manager**

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

## 2 Version

| Version No. | Date          | Description |
|-------------|---------------|-------------|
| 00          | Sep. 03, 2018 | Original    |
|             |               |             |
|             |               |             |
|             |               |             |
|             |               |             |

**Prepared By:**

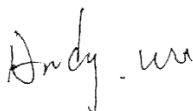


**Date:**

Sep. 03, 2018

**Project Engineer**

**Check By:**



**Date:**

Sep. 03, 2018

**Reviewer**

## 3 Contents

|                                                       | Page |
|-------------------------------------------------------|------|
| 1 COVER PAGE.....                                     | 1    |
| 2 VERSION.....                                        | 2    |
| 3 CONTENTS .....                                      | 3    |
| 4 TEST SUMMARY .....                                  | 4    |
| 4.1 MEASUREMENT UNCERTAINTY .....                     | 4    |
| 5 GENERAL INFORMATION.....                            | 5    |
| 5.1 GENERAL DESCRIPTION OF EUT .....                  | 5    |
| 5.2 TEST MODE .....                                   | 7    |
| 5.3 DESCRIPTION OF SUPPORT UNITS .....                | 7    |
| 5.4 TEST FACILITY.....                                | 7    |
| 5.5 TEST LOCATION .....                               | 7    |
| 5.6 OTHER INFORMATION REQUESTED BY THE CUSTOMER ..... | 7    |
| 5.7 ADDITIONAL INSTRUCTIONS.....                      | 8    |
| 6 TEST INSTRUMENTS LIST .....                         | 9    |
| 7 TEST RESULTS AND MEASUREMENT DATA.....              | 11   |
| 7.1 ANTENNA REQUIREMENT.....                          | 11   |
| 7.2 RADIATED EMISSION METHOD.....                     | 12   |
| 7.2.1 Field Strength of The Fundamental Signal .....  | 15   |
| 7.2.2 Spurious emissions.....                         | 16   |
| 7.2.3 Bandedge emissions.....                         | 21   |
| 7.3 20dB OCCUPY BANDWIDTH .....                       | 23   |
| 8 TEST SETUP PHOTO.....                               | 25   |
| 9 EUT CONSTRUCTIONAL DETAILS .....                    | 26   |

## 4 Test Summary

| Test Item                                | Section in CFR 47     | Result |
|------------------------------------------|-----------------------|--------|
| Antenna requirement                      | 15.203                | Pass   |
| AC Power Line Conducted Emission         | 15.207                | N/A    |
| Field strength of the fundamental signal | 15.249 (a)            | Pass   |
| Spurious emissions                       | 15.249 (a) (d)/15.209 | Pass   |
| Band edge                                | 15.249 (d)/15.205     | Pass   |
| 20dB Occupied Bandwidth                  | 15.215 (c)            | Pass   |

*Pass: The EUT complies with the essential requirements in the standard.*

*N/A: Not applicable.*

*Remark: Test according to ANSI C63.10: 2013 and ANSI C63.4: 2014.*

### 4.1 Measurement Uncertainty

| Test Item                        | Frequency Range | Measurement Uncertainty | Notes |
|----------------------------------|-----------------|-------------------------|-------|
| Radiated Emission                | 9kHz ~ 30MHz    | $\pm 4.34\text{dB}$     | (1)   |
| Radiated Emission                | 30MHz ~ 1000MHz | $\pm 4.24\text{dB}$     | (1)   |
| Radiated Emission                | 1GHz ~ 26.5GHz  | $\pm 4.68\text{dB}$     | (1)   |
| AC Power Line Conducted Emission | 0.15MHz ~ 30MHz | $\pm 3.45\text{dB}$     | (1)   |

Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

## 5 General Information

### 5.1 General Description of EUT

|                      |                            |
|----------------------|----------------------------|
| Product Name:        | 2.4G Keyboard              |
| Model No.:           | HW126                      |
| Serial No.:          | HSHW12600003               |
| Test sample(s) ID:   | GTS201808000161-1          |
| Sample(s) Status     | Engineer sample            |
| Hardware:            | V 1.0                      |
| Software:            | V 1.0                      |
| Operation Frequency: | 2405MHz~2470MHz            |
| Channel numbers:     | 8                          |
| Modulation type:     | GFSK                       |
| Antenna Type:        | PCB antenna                |
| Antenna gain:        | -1.2dBi                    |
| Power supply:        | DC 2.4V by Ni-MH batteries |

| Operation Frequency each of channel |           |         |           |
|-------------------------------------|-----------|---------|-----------|
| Channel                             | Frequency | Channel | Frequency |
| 01                                  | 2405MHz   | 05      | 2440MHz   |
| 02                                  | 2413MHz   | 06      | 2450MHz   |
| 03                                  | 2422MHz   | 07      | 2460MHz   |
| 04                                  | 2430MHz   | 08      | 2470MHz   |

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the Lowest frequency, the middle frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

| Channel             | Frequency |
|---------------------|-----------|
| The lowest channel  | 2405MHz   |
| The middle channel  | 2430MHz   |
| The Highest channel | 2470MHz   |

## 5.2 Test mode

|                                                                                                                                                                                                                                                                     |                                                 |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| Transmitting mode                                                                                                                                                                                                                                                   | Keep the EUT in continuously transmitting mode. |
| <i>Remark: During the test, the dutycycle &gt;98%, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.</i> |                                                 |

### Per-test mode.

We have verified the construction and function in typical operation, The EUT was placed on three different polar directions; i.e. X axis, Y axis, Z axis. which was shown in this test report and defined as follows:

| Axis                   | X     | Y     | Z     |
|------------------------|-------|-------|-------|
| Field Strength(dBuV/m) | 93.73 | 90.57 | 91.86 |

## 5.3 Description of Support Units

N/A

## 5.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **FCC —Registration No.: 381383**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 381383, January 08, 2018.

- **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016

## 5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102

Tel: 0755-27798480

Fax: 0755-27798960

## 5.6 Other Information Requested by the Customer

None.

## 5.7 Additional instructions

Software (Used for test) from client

|      |                                                                                                                                                                        |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Mode | Special software is used.<br>The software provided by client to enable the EUT under transmission condition continuously at specific channel frequencies individually. |
|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                |             |                 |                   |
|------------------------------------------------|-------------|-----------------|-------------------|
| Power level setup in software                  |             |                 |                   |
| Test Software Name                             | N/A         |                 |                   |
| Test Software Version                          | N/A         |                 |                   |
| Support Units<br>(Software installation media) | Description | Manufacturer    | Model             |
|                                                | N/A         | N/A             | N/A               |
| Mode                                           | Channel     | Frequency (MHz) | Soft Set          |
| GFSK                                           | CH01        | 2405            | TX LEVEL: Default |
|                                                | CH04        | 2430            |                   |
|                                                | CH08        | 2470            |                   |

## 6 Test Instruments list

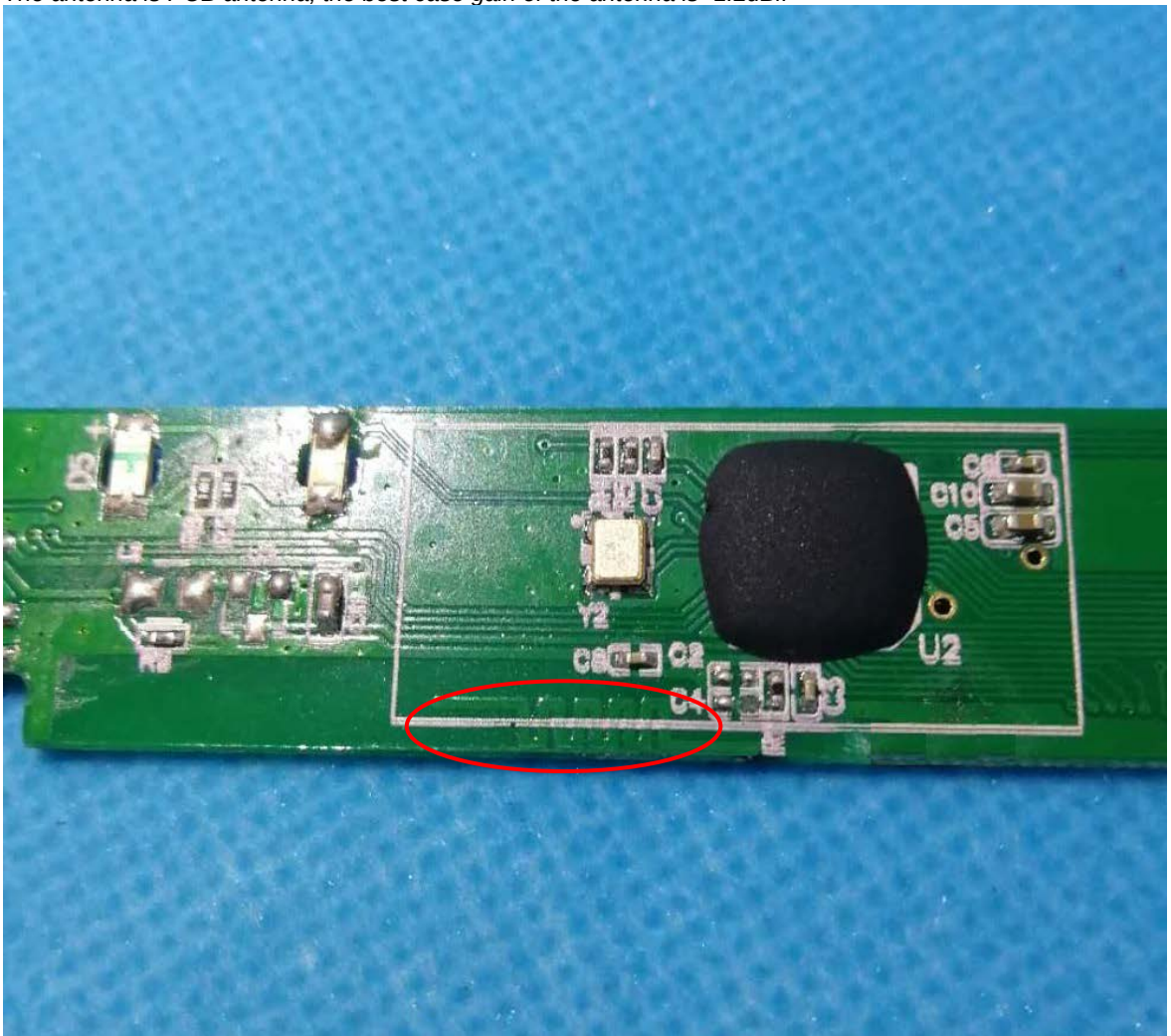
| Radiated Emission: |                                        |                                |                             |               |                     |                         |
|--------------------|----------------------------------------|--------------------------------|-----------------------------|---------------|---------------------|-------------------------|
| Item               | Test Equipment                         | Manufacturer                   | Model No.                   | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                  | 3m Semi- Anechoic Chamber              | ZhongYu Electron               | 9.2(L)*6.2(W)* 6.4(H)       | GTS250        | July. 03 2015       | July. 02 2020           |
| 2                  | Control Room                           | ZhongYu Electron               | 6.2(L)*2.5(W)* 2.4(H)       | GTS251        | N/A                 | N/A                     |
| 3                  | EMI Test Receiver                      | Rohde & Schwarz                | ESU26                       | GTS203        | June. 27 2018       | June. 26 2019           |
| 4                  | BiConiLog Antenna                      | SCHWARZBECK<br>MESS-ELEKTRONIK | VULB9163                    | GTS214        | June. 27 2018       | June. 26 2019           |
| 5                  | Double -ridged waveguide<br>horn       | SCHWARZBECK<br>MESS-ELEKTRONIK | BBHA 9120 D                 | GTS208        | June. 27 2018       | June. 26 2019           |
| 6                  | Horn Antenna                           | ETS-LINDGREN                   | 3160                        | GTS217        | June. 27 2018       | June. 26 2019           |
| 7                  | EMI Test Software                      | AUDIX                          | E3                          | N/A           | N/A                 | N/A                     |
| 8                  | Coaxial Cable                          | GTS                            | N/A                         | GTS213        | June. 27 2018       | June. 26 2019           |
| 9                  | Coaxial Cable                          | GTS                            | N/A                         | GTS211        | June. 27 2018       | June. 26 2019           |
| 10                 | Coaxial cable                          | GTS                            | N/A                         | GTS210        | June. 27 2018       | June. 26 2019           |
| 11                 | Coaxial Cable                          | GTS                            | N/A                         | GTS212        | June. 27 2018       | June. 26 2019           |
| 12                 | Amplifier(100kHz-3GHz)                 | HP                             | 8347A                       | GTS204        | June. 27 2018       | June. 26 2019           |
| 13                 | Amplifier(2GHz-20GHz)                  | HP                             | 84722A                      | GTS206        | June. 27 2018       | June. 26 2019           |
| 14                 | Amplifier (18-26GHz)                   | Rohde & Schwarz                | AFS33-18002<br>650-30-8P-44 | GTS218        | June. 27 2018       | June. 26 2019           |
| 15                 | Band filter                            | Amindeon                       | 82346                       | GTS219        | June. 27 2018       | June. 26 2019           |
| 16                 | Power Meter                            | Anritsu                        | ML2495A                     | GTS540        | June. 27 2018       | June. 26 2019           |
| 17                 | Power Sensor                           | Anritsu                        | MA2411B                     | GTS541        | June. 27 2018       | June. 26 2019           |
| 18                 | Wideband Radio<br>Communication Tester | Rohde & Schwarz                | CMW500                      | GTS575        | June. 27 2018       | June. 26 2019           |
| 19                 | Splitter                               | Agilent                        | 11636B                      | GTS237        | June. 27 2018       | June. 26 2019           |
| 20                 | Loop Antenna                           | ZHINAN                         | ZN30900A                    | GTS534        | June. 27 2018       | June. 26 2019           |

| General used equipment: |                                    |              |           |               |                     |                         |
|-------------------------|------------------------------------|--------------|-----------|---------------|---------------------|-------------------------|
| Item                    | Test Equipment                     | Manufacturer | Model No. | Inventory No. | Cal.Date (mm-dd-yy) | Cal.Due date (mm-dd-yy) |
| 1                       | Humidity/<br>Temperature Indicator | KTJ          | TA328     | GTS243        | June. 27 2018       | June. 26 2019           |
| 2                       | Barometer                          | ChangChun    | DYM3      | GTS255        | June. 27 2018       | June. 26 2019           |

| RF Conducted Test: |                                                |              |                  |            |                        |                            |
|--------------------|------------------------------------------------|--------------|------------------|------------|------------------------|----------------------------|
| Item               | Test Equipment                                 | Manufacturer | Model No.        | Serial No. | Cal.Date<br>(mm-dd-yy) | Cal.Due date<br>(mm-dd-yy) |
| 1                  | MXA Signal Analyzer                            | Agilent      | N9020A           | GTS566     | June. 27 2018          | June. 26 2019              |
| 2                  | EMI Test Receiver                              | R&S          | ESCI 7           | GTS552     | June. 27 2018          | June. 26 2019              |
| 3                  | Spectrum Analyzer                              | Agilent      | E4440A           | GTS533     | June. 27 2018          | June. 26 2019              |
| 4                  | MXG vector Signal Generator                    | Agilent      | N5182A           | GTS567     | June. 27 2018          | June. 26 2019              |
| 5                  | ESG Analog Signal Generator                    | Agilent      | E4428C           | GTS568     | June. 27 2018          | June. 26 2019              |
| 6                  | USB RF Power Sensor                            | DARE         | RPR3006W         | GTS569     | June. 27 2018          | June. 26 2019              |
| 7                  | RF Switch Box                                  | Shongyi      | RFSW3003328      | GTS571     | June. 27 2018          | June. 26 2019              |
| 8                  | EMI Test Receiver                              | R&S          | ESCI 7           | GTS552     | June. 27 2018          | June. 26 2019              |
| 9                  | Programmable Constant Temp & Humi Test Chamber | WEWON        | WHTH-150L-40-880 | GTS572     | June. 27 2018          | June. 26 2019              |

## 7 Test results and Measurement Data

### 7.1 Antenna requirement

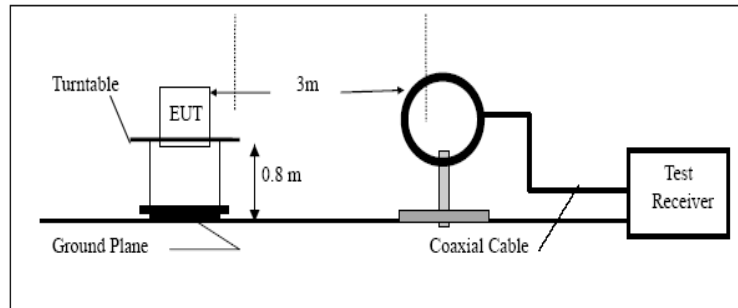
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Standard requirement:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                            | FCC Part15 C Section 15.203 |
| <b>15.203 requirement:</b><br><p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.</p> |                             |
| <b>EUT Antenna:</b><br><p><i>The antenna is PCB antenna, the best case gain of the antenna is -1.2dBi.</i></p>                                                                                                                                                                                                                                                                                       |                             |

## 7.2 Radiated Emission Method

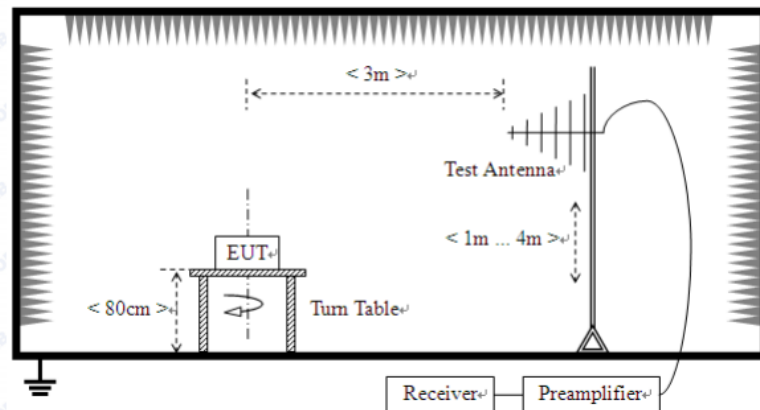
|                                                         |                                                                                                                                                                                                                                                                |            |                    |         |                         |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------|---------|-------------------------|
| Test Requirement:                                       | FCC Part15 C Section 15.209                                                                                                                                                                                                                                    |            |                    |         |                         |
| Test Method:                                            | ANSI C63.10:2013                                                                                                                                                                                                                                               |            |                    |         |                         |
| Test Frequency Range:                                   | 9kHz to 25GHz                                                                                                                                                                                                                                                  |            |                    |         |                         |
| Test site:                                              | Measurement Distance: 3m                                                                                                                                                                                                                                       |            |                    |         |                         |
| Receiver setup:                                         | Frequency                                                                                                                                                                                                                                                      | Detector   | RBW                | VBW     | Value                   |
|                                                         | 9KHz-150KHz                                                                                                                                                                                                                                                    | Quasi-peak | 200Hz              | 600Hz   | Quasi-peak              |
|                                                         | 150KHz-30MHz                                                                                                                                                                                                                                                   | Quasi-peak | 9KHz               | 30KHz   | Quasi-peak              |
|                                                         | 30MHz-1GHz                                                                                                                                                                                                                                                     | Quasi-peak | 100KHz             | 300KHz  | Quasi-peak              |
|                                                         | Above 1GHz                                                                                                                                                                                                                                                     | Peak       | 1MHz               | 3MHz    | Peak                    |
|                                                         |                                                                                                                                                                                                                                                                | Peak       | 1MHz               | 10Hz    | Average                 |
| Limit:<br>(Field strength of the<br>fundamental signal) | Frequency                                                                                                                                                                                                                                                      |            | Limit (dBuV/m @3m) |         | Remark                  |
|                                                         | 2400MHz-2483.5MHz                                                                                                                                                                                                                                              |            | 94.00              |         | Average Value           |
|                                                         |                                                                                                                                                                                                                                                                |            | 114.00             |         | Peak Value              |
| Limit:<br>(Spurious Emissions)                          | Frequency                                                                                                                                                                                                                                                      |            | Limit (uV/m)       | Value   | Measurement<br>Distance |
|                                                         | 0.009MHz-0.490MHz                                                                                                                                                                                                                                              |            | 2400/F(KHz)        | QP      | 300m                    |
|                                                         | 0.490MHz-1.705MHz                                                                                                                                                                                                                                              |            | 24000/F(KHz)       | QP      | 300m                    |
|                                                         | 1.705MHz-30MHz                                                                                                                                                                                                                                                 |            | 30                 | QP      | 30m                     |
|                                                         | 30MHz-88MHz                                                                                                                                                                                                                                                    |            | 100                | QP      | 3m                      |
|                                                         | 88MHz-216MHz                                                                                                                                                                                                                                                   |            | 150                | QP      |                         |
|                                                         | 216MHz-960MHz                                                                                                                                                                                                                                                  |            | 200                | QP      |                         |
|                                                         | 960MHz-1GHz                                                                                                                                                                                                                                                    |            | 500                | QP      |                         |
|                                                         | Above 1GHz                                                                                                                                                                                                                                                     |            | 500                | Average |                         |
|                                                         |                                                                                                                                                                                                                                                                |            | 5000               | Peak    |                         |
| Limit:<br>(band edge)                                   | Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation. |            |                    |         |                         |

Test setup:

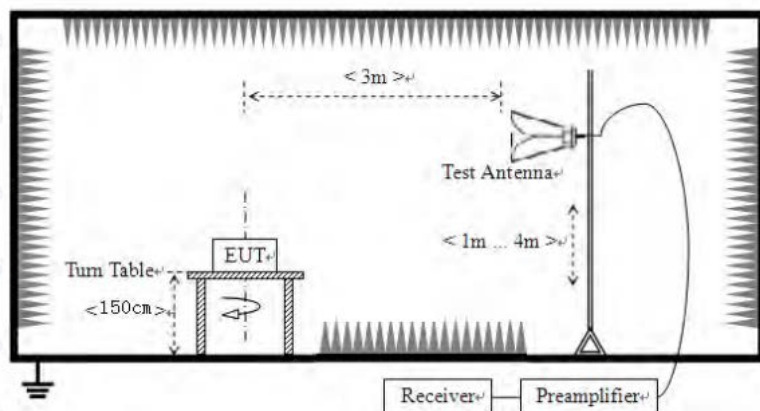
Below 30MHz



Below 1GHz



Above 1GHz



|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Procedure:   | <ol style="list-style-type: none"><li>1. The EUT was placed on the top of a rotating table (0.8m for below 1G and 1.5m for above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.</li><li>2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.</li><li>3. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.</li><li>4. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.</li><li>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</li><li>6. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.</li></ol> |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

**Measurement data:**

## 7.2.1 Field Strength of The Fundamental Signal

### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2405.00         | 85.17             | 27.15                 | 3.65            | 36.12                    | 79.85          | 114.00              | -34.15          | Vertical     |
| 2405.00         | 98.13             | 27.15                 | 3.65            | 36.12                    | 92.81          | 114.00              | -21.19          | Horizontal   |
| 2430.00         | 84.59             | 27.22                 | 3.66            | 36.19                    | 79.28          | 114.00              | -34.72          | Vertical     |
| 2430.00         | 98.51             | 27.22                 | 3.66            | 36.19                    | 93.20          | 114.00              | -20.80          | Horizontal   |
| 2470.00         | 83.42             | 27.32                 | 3.67            | 36.29                    | 78.12          | 114.00              | -35.88          | Vertical     |
| 2470.00         | 99.03             | 27.32                 | 3.67            | 36.29                    | 93.73          | 114.00              | -20.27          | Horizontal   |

### Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamplifier Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------------|----------------|---------------------|-----------------|--------------|
| 2405.00         | 82.61             | 27.15                 | 3.65            | 36.12                    | 77.29          | 94.00               | -16.71          | Vertical     |
| 2405.00         | 95.82             | 27.15                 | 3.65            | 36.12                    | 90.50          | 94.00               | -3.50           | Horizontal   |
| 2430.00         | 82.22             | 27.22                 | 3.66            | 36.19                    | 76.91          | 94.00               | -17.09          | Vertical     |
| 2430.00         | 96.00             | 27.22                 | 3.66            | 36.19                    | 90.69          | 94.00               | -3.31           | Horizontal   |
| 2470.00         | 80.76             | 27.32                 | 3.67            | 36.29                    | 75.46          | 94.00               | -18.54          | Vertical     |
| 2470.00         | 96.53             | 27.32                 | 3.67            | 36.29                    | 91.23          | 94.00               | -2.77           | Horizontal   |

## 7.2.2 Spurious emissions

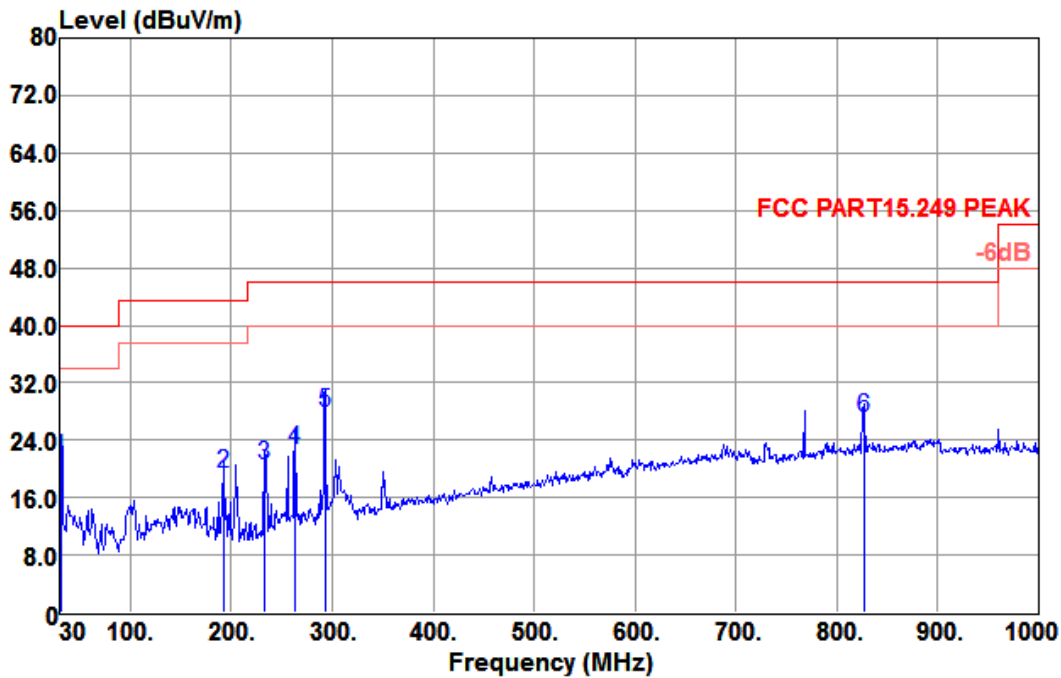
### ■ 9 kHz ~ 30 MHz

The low frequency, which started from 9 kHz to 30 MHz, was pre-scanned and the result which was 20 dB lower than the limit line per 15.31(o) was not reported.

### ■ Below 1GHz

|                  |                   |               |            |
|------------------|-------------------|---------------|------------|
| Mode:            | Transmitting mode | Test by:      | Jason      |
| Temp./Hum.(%RH): | 26°C/56%RH        | Polarization: | Horizontal |

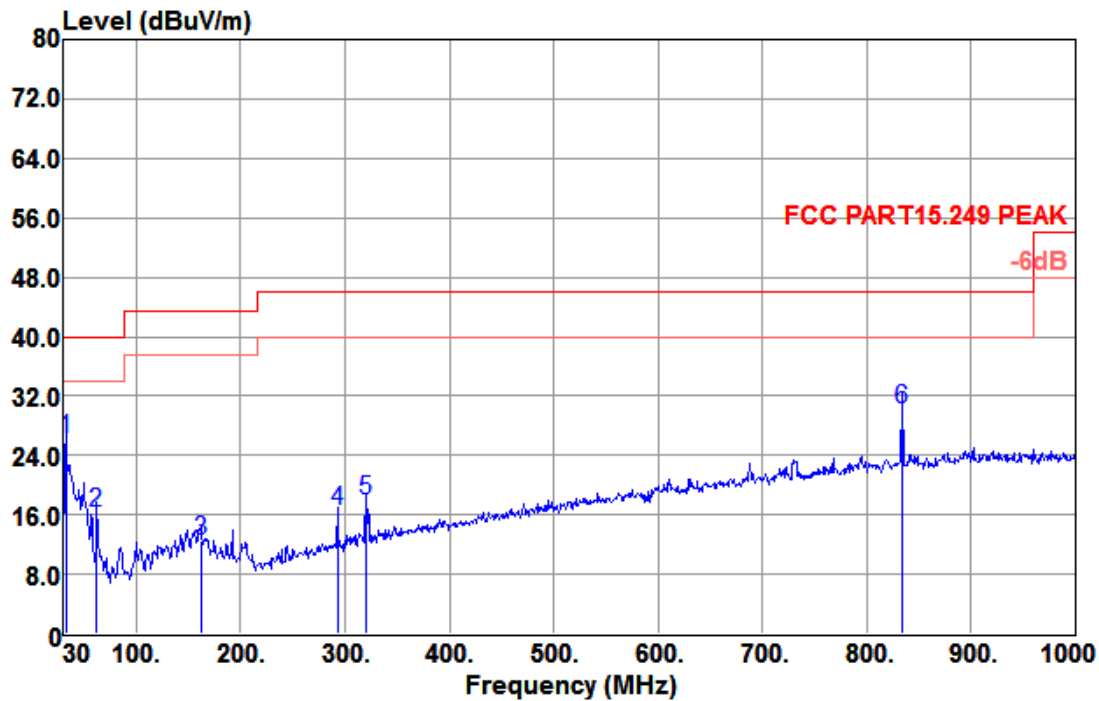
Data: 7



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|--------|
| 31.940      | 39.83                    | 13.28                     | 1.00                | 32.53                  | 21.58         | 40.00                    | -18.42              | QP     |
| 191.990     | 38.69                    | 10.38                     | 2.78                | 32.54                  | 19.31         | 43.50                    | -24.19              | QP     |
| 233.700     | 39.08                    | 10.91                     | 3.02                | 32.54                  | 20.47         | 46.00                    | -25.53              | QP     |
| 263.770     | 40.05                    | 11.81                     | 3.25                | 32.53                  | 22.58         | 46.00                    | -23.42              | QP     |
| 292.870     | 44.23                    | 12.69                     | 3.42                | 32.52                  | 27.82         | 46.00                    | -18.18              | QP     |
| 826.370     | 32.49                    | 21.04                     | 6.05                | 32.50                  | 27.08         | 46.00                    | -18.92              | QP     |

|                  |                   |               |          |
|------------------|-------------------|---------------|----------|
| Mode:            | Transmitting mode | Test by:      | Jason    |
| Temp./Hum.(%RH): | 26°C/56%RH        | Polarization: | Vertical |

Data: 8



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamplifier<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------------|---------------|--------------------------|---------------------|--------|
| 32.910      | 44.30                    | 13.32                     | 1.04                | 32.53                        | 26.13         | 40.00                    | -13.87              | QP     |
| 62.010      | 35.09                    | 12.32                     | 1.52                | 32.54                        | 16.39         | 40.00                    | -23.61              | QP     |
| 161.920     | 28.60                    | 14.01                     | 2.49                | 32.52                        | 12.58         | 43.50                    | -30.92              | QP     |
| 292.870     | 32.89                    | 12.69                     | 3.42                | 32.52                        | 16.48         | 46.00                    | -29.52              | QP     |
| 320.030     | 33.60                    | 13.28                     | 3.56                | 32.51                        | 17.93         | 46.00                    | -28.07              | QP     |
| 834.130     | 35.60                    | 21.11                     | 6.02                | 32.45                        | 30.28         | 46.00                    | -15.72              | QP     |

## ■ Above 1GHz

|               |                |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

### Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4810.00         | 54.64             | 31.24                 | 5.44            | 36.27              | 55.05          | 74.00               | -18.95          | Vertical     |
| 7215.00         | 53.02             | 35.89                 | 6.96            | 34.25              | 61.62          | 74.00               | -12.38          | Vertical     |
| 9620.00         | 51.15             | 37.82                 | 7.79            | 34.13              | 62.63          | 74.00               | -11.37          | Vertical     |
| 12025.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14430.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4810.00         | 61.78             | 31.24                 | 5.44            | 36.27              | 62.19          | 74.00               | -11.81          | Horizontal   |
| 7215.00         | 55.39             | 35.89                 | 6.96            | 34.25              | 63.99          | 74.00               | -10.01          | Horizontal   |
| 9620.00         | 50.86             | 37.82                 | 7.79            | 34.13              | 62.34          | 74.00               | -11.66          | Horizontal   |
| 12025.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14430.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

### Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4810.00         | 44.60             | 31.24                 | 5.44            | 36.27              | 45.01          | 54.00               | -8.99           | Vertical     |
| 7215.00         | 42.76             | 35.89                 | 6.96            | 34.25              | 51.36          | 54.00               | -2.64           | Vertical     |
| 9620.00         | 40.97             | 37.82                 | 7.79            | 34.13              | 52.45          | 54.00               | -1.55           | Vertical     |
| 12025.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14430.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4810.00         | 51.17             | 31.24                 | 5.44            | 36.27              | 51.58          | 54.00               | -2.42           | Horizontal   |
| 7215.00         | 44.18             | 35.89                 | 6.96            | 34.25              | 52.78          | 54.00               | -1.22           | Horizontal   |
| 9620.00         | 40.87             | 37.82                 | 7.79            | 34.13              | 52.35          | 54.00               | -1.65           | Horizontal   |
| 12025.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14430.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

### Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Pre-amplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.

|               |        |
|---------------|--------|
| Test channel: | Middle |
|---------------|--------|

**Peak value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4860.00         | 53.95             | 31.36                 | 5.42            | 36.25              | 54.48          | 74.00               | -19.52          | Vertical     |
| 7290.00         | 52.54             | 36.07                 | 7.18            | 34.33              | 61.46          | 74.00               | -12.54          | Vertical     |
| 9720.00         | 52.23             | 38.00                 | 7.92            | 34.18              | 63.97          | 74.00               | -10.03          | Vertical     |
| 12150.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14580.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4860.00         | 59.00             | 31.36                 | 5.42            | 36.25              | 59.53          | 74.00               | -14.47          | Horizontal   |
| 7290.00         | 54.41             | 36.07                 | 7.18            | 34.33              | 63.33          | 74.00               | -10.67          | Horizontal   |
| 9720.00         | 50.48             | 38.00                 | 7.92            | 34.18              | 62.22          | 74.00               | -11.78          | Horizontal   |
| 12150.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14580.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

**Average value:**

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4860.00         | 42.27             | 31.36                 | 5.42            | 36.25              | 42.80          | 54.00               | -11.20          | Vertical     |
| 7290.00         | 41.94             | 36.07                 | 7.18            | 34.33              | 50.86          | 54.00               | -3.14           | Vertical     |
| 9720.00         | 40.52             | 38.00                 | 7.92            | 34.18              | 52.26          | 54.00               | -1.74           | Vertical     |
| 12150.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14580.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4860.00         | 48.86             | 31.36                 | 5.42            | 36.25              | 49.39          | 54.00               | -4.61           | Horizontal   |
| 7290.00         | 43.30             | 36.07                 | 7.18            | 34.33              | 52.22          | 54.00               | -1.78           | Horizontal   |
| 9720.00         | 40.86             | 38.00                 | 7.92            | 34.18              | 52.60          | 54.00               | -1.40           | Horizontal   |
| 12150.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14580.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

**Remark:**

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is too weak instrument of signal is unable to test.

|               |         |
|---------------|---------|
| Test channel: | Highest |
|---------------|---------|

## Peak value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4940.00         | 55.06             | 31.56                 | 5.37            | 36.22              | 55.77          | 74.00               | -18.23          | Vertical     |
| 7410.00         | 51.89             | 36.33                 | 7.49            | 34.44              | 61.28          | 74.00               | -12.72          | Vertical     |
| 9880.00         | 49.85             | 38.28                 | 8.04            | 34.25              | 61.93          | 74.00               | -12.07          | Vertical     |
| 12350.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 14820.00        | *                 |                       |                 |                    |                | 74.00               |                 | Vertical     |
| 4940.00         | 58.34             | 31.56                 | 5.37            | 36.22              | 59.05          | 74.00               | -14.95          | Horizontal   |
| 7410.00         | 53.27             | 36.35                 | 7.49            | 34.44              | 62.66          | 74.00               | -11.34          | Horizontal   |
| 9880.00         | 49.85             | 38.28                 | 8.04            | 34.25              | 61.92          | 74.00               | -12.08          | Horizontal   |
| 12350.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |
| 14820.00        | *                 |                       |                 |                    |                | 74.00               |                 | Horizontal   |

## Average value:

| Frequency (MHz) | Read Level (dBuV) | Antenna Factor (dB/m) | Cable Loss (dB) | Preamp Factor (dB) | Level (dBuV/m) | Limit Line (dBuV/m) | Over Limit (dB) | polarization |
|-----------------|-------------------|-----------------------|-----------------|--------------------|----------------|---------------------|-----------------|--------------|
| 4940.00         | 43.59             | 31.56                 | 5.37            | 36.22              | 44.30          | 54.00               | -9.70           | Vertical     |
| 7410.00         | 41.76             | 36.33                 | 7.49            | 34.44              | 51.15          | 54.00               | -2.85           | Vertical     |
| 9880.00         | 38.06             | 38.28                 | 8.04            | 34.25              | 50.13          | 54.00               | -3.87           | Vertical     |
| 12350.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 14820.00        | *                 |                       |                 |                    |                | 54.00               |                 | Vertical     |
| 4940.00         | 48.03             | 31.56                 | 5.37            | 36.22              | 48.74          | 54.00               | -5.26           | Horizontal   |
| 7410.00         | 42.46             | 36.35                 | 7.49            | 34.44              | 51.85          | 54.00               | -2.15           | Horizontal   |
| 9880.00         | 40.37             | 38.28                 | 8.04            | 34.25              | 52.44          | 54.00               | -1.56           | Horizontal   |
| 12350.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |
| 14820.00        | *                 |                       |                 |                    |                | 54.00               |                 | Horizontal   |

## Remark:

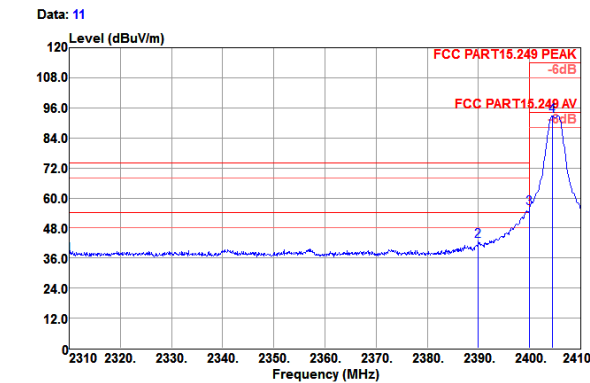
1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “\*”, means this data is the too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

## 7.2.3 Bandedge emissions

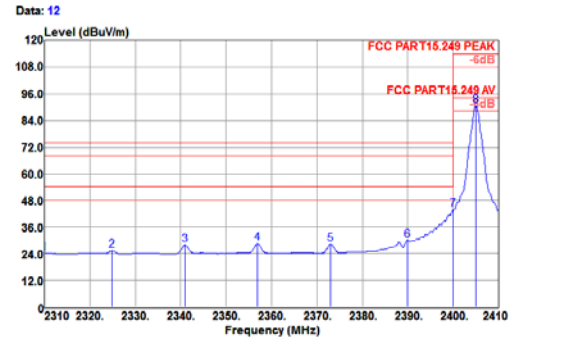
All of the restriction bands were tested, and only the data of worst case was exhibited.

|               |                |
|---------------|----------------|
| Test channel: | Lowest channel |
|---------------|----------------|

Horizontal

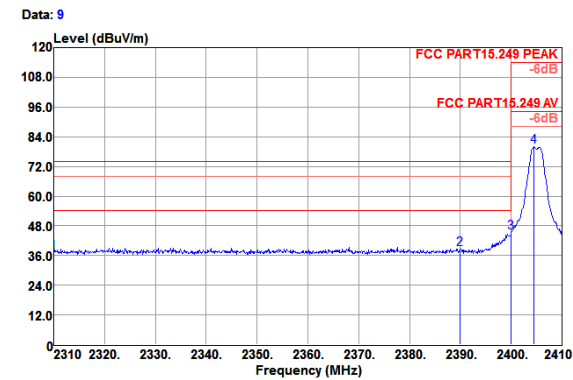


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|--------|
| 2310.000    | 42.64                    | 26.91                     | 3.56                | 35.87                  | 37.24         | 74.00                    | -36.76              | Peak   |
| 2390.000    | 48.08                    | 27.11                     | 3.64                | 36.08                  | 42.75         | 74.00                    | -31.25              | Peak   |
| 2400.000    | 61.23                    | 27.14                     | 3.65                | 36.11                  | 55.91         | 74.00                    | -18.09              | Peak   |
| 2404.400    | 98.13                    | 27.15                     | 3.65                | 36.12                  | 92.81         | 114.00                   | -21.19              | Peak   |

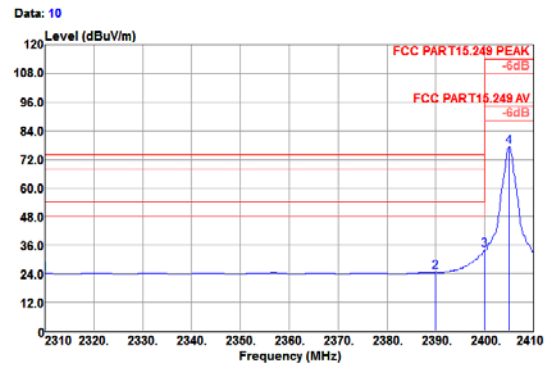


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|---------|
| 2310.000    | 29.61                    | 26.91                     | 3.56                | 35.87                  | 24.21         | 54.00                    | -29.79              | Average |
| 2324.900    | 30.79                    | 26.94                     | 3.57                | 35.91                  | 25.39         | 54.00                    | -28.61              | Average |
| 2341.000    | 33.21                    | 26.99                     | 3.59                | 35.95                  | 27.84         | 54.00                    | -26.16              | Average |
| 2356.900    | 33.88                    | 27.03                     | 3.60                | 35.99                  | 28.52         | 54.00                    | -25.48              | Average |
| 2373.000    | 33.85                    | 27.07                     | 3.62                | 36.03                  | 28.51         | 54.00                    | -25.49              | Average |
| 2390.000    | 35.40                    | 27.11                     | 3.64                | 36.08                  | 30.07         | 54.00                    | -23.93              | Average |
| 2400.000    | 49.13                    | 27.14                     | 3.65                | 36.11                  | 43.81         | 54.00                    | -10.19              | Average |
| 2405.000    | 95.82                    | 27.15                     | 3.65                | 36.12                  | 90.50         | 94.00                    | -3.50               | Average |

Vertical



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|--------|
| 2310.000    | 42.75                    | 26.91                     | 3.56                | 35.87                  | 37.35         | 74.00                    | -36.65              | Peak   |
| 2390.000    | 44.04                    | 27.11                     | 3.64                | 36.08                  | 38.71         | 74.00                    | -35.29              | Peak   |
| 2400.000    | 50.72                    | 27.14                     | 3.65                | 36.11                  | 45.40         | 74.00                    | -28.60              | Peak   |
| 2404.400    | 85.17                    | 27.15                     | 3.65                | 36.12                  | 79.85         | 114.00                   | -34.15              | Peak   |

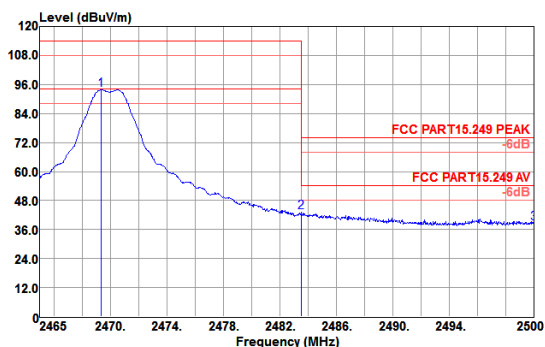


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|---------|
| 2310.000    | 29.46                    | 26.91                     | 3.56                | 35.87                  | 24.06         | 54.00                    | -29.94              | Average |
| 2390.000    | 29.96                    | 27.11                     | 3.64                | 36.08                  | 24.63         | 54.00                    | -29.37              | Average |
| 2400.000    | 39.31                    | 27.14                     | 3.65                | 36.11                  | 33.99         | 54.00                    | -20.01              | Average |
| 2405.000    | 82.61                    | 27.15                     | 3.65                | 36.12                  | 77.29         | 94.00                    | -16.71              | Average |

|               |                 |
|---------------|-----------------|
| Test channel: | Highest channel |
|---------------|-----------------|

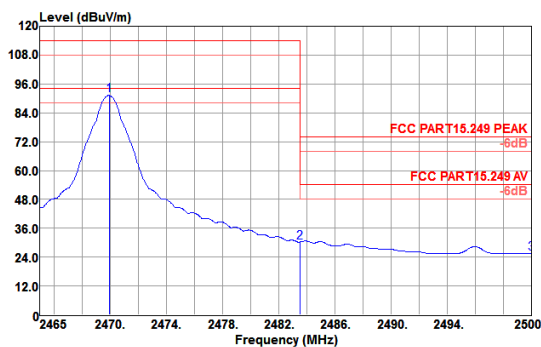
## Horizontal

Data: 19



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|--------|
| 2469.375    | 99.03                    | 27.32                     | 3.67                | 36.29                  | 93.73         | 114.00                   | -20.27              | Peak   |
| 2483.500    | 48.44                    | 27.36                     | 3.68                | 36.33                  | 43.15         | 74.00                    | -30.85              | Peak   |
| 2500.000    | 44.02                    | 27.40                     | 3.68                | 36.37                  | 38.73         | 74.00                    | -35.27              | Peak   |

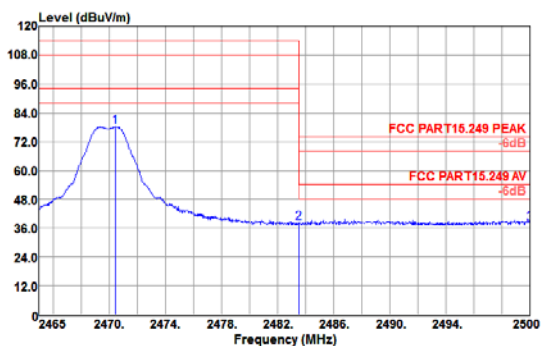
Data: 20



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|---------|
| 2469.935    | 96.53                    | 27.32                     | 3.67                | 36.29                  | 91.23         | 94.00                    | -2.77               | Average |
| 2483.515    | 35.54                    | 27.36                     | 3.68                | 36.33                  | 30.25         | 54.00                    | -23.75              | Average |
| 2500.000    | 30.77                    | 27.40                     | 3.68                | 36.37                  | 25.48         | 54.00                    | -28.52              | Average |

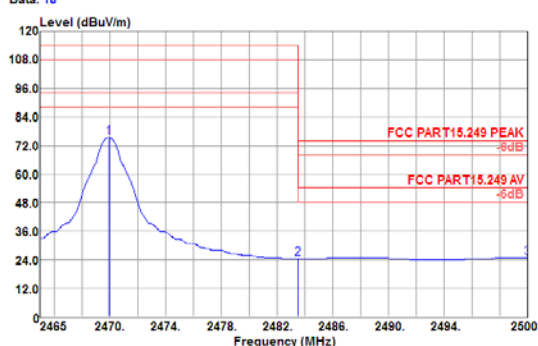
## Vertical

Data: 17



| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|--------|
| 2470.460    | 83.42                    | 27.32                     | 3.67                | 36.29                  | 78.12         | 114.00                   | -35.88              | Peak   |
| 2483.500    | 43.49                    | 27.36                     | 3.68                | 36.33                  | 38.20         | 74.00                    | -35.80              | Peak   |
| 2500.000    | 43.26                    | 27.40                     | 3.68                | 36.37                  | 37.97         | 74.00                    | -36.03              | Peak   |

Data: 18

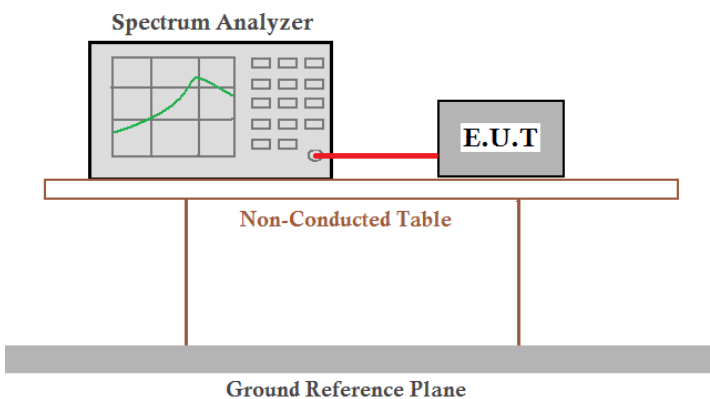


| Freq<br>MHz | Reading<br>level<br>dBuV | Antenna<br>factor<br>dB/m | Cable<br>loss<br>dB | Preamp<br>factor<br>dB | level<br>dBuV | Limit<br>level<br>dBuV/m | Over<br>limit<br>dB | Remark  |
|-------------|--------------------------|---------------------------|---------------------|------------------------|---------------|--------------------------|---------------------|---------|
| 2469.935    | 80.76                    | 27.32                     | 3.67                | 36.29                  | 75.46         | 94.00                    | -18.54              | Average |
| 2483.515    | 29.72                    | 27.36                     | 3.68                | 36.33                  | 24.43         | 54.00                    | -29.57              | Average |
| 2500.000    | 30.06                    | 27.40                     | 3.68                | 36.37                  | 24.77         | 54.00                    | -29.23              | Average |

## Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

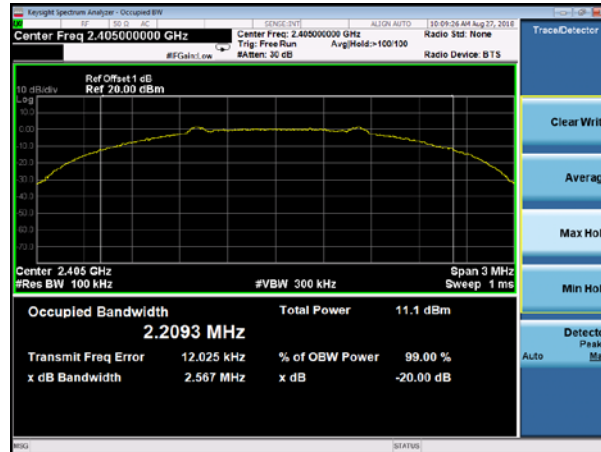
## 7.3 20dB Occupy Bandwidth

|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test Requirement: | FCC Part15 C Section 15.249/15.215                                                                                                                                                                                                                                                                                                                                                                                                             |
| Test Method:      | ANSI C63.10:2013                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Limit:            | Operation Frequency range 2400MHz~2483.5MHz                                                                                                                                                                                                                                                                                                                                                                                                    |
| Test setup:       |  <p>The diagram illustrates the test setup. A Spectrum Analyzer, shown with a green trace on its screen, is connected to an E.U.T. (Equipment Under Test) by a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a table labeled 'Non-Conducted Table'. Below this table is a thick grey bar representing the 'Ground Reference Plane'.</p> |
| Test Instruments: | Refer to section 6.0 for details                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test mode:        | Refer to section 5.2 for details                                                                                                                                                                                                                                                                                                                                                                                                               |
| Test results:     | Pass                                                                                                                                                                                                                                                                                                                                                                                                                                           |

### Measurement Data

| Test channel | 20dB bandwidth(MHz) | Result |
|--------------|---------------------|--------|
| Lowest       | 2.567               | Pass   |
| Middle       | 2.567               | Pass   |
| Highest      | 2.556               | Pass   |

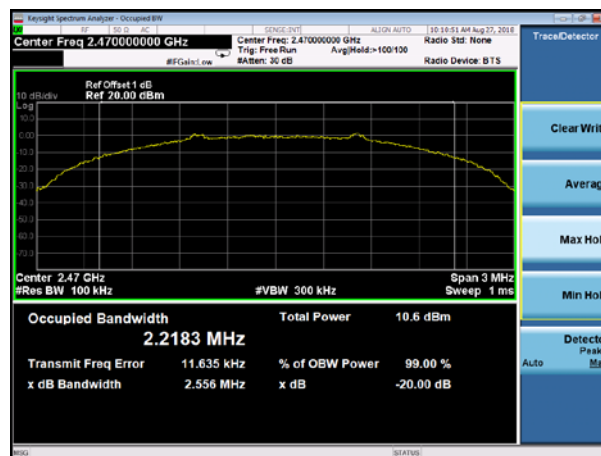
Test plot as follows:



Lowest channel



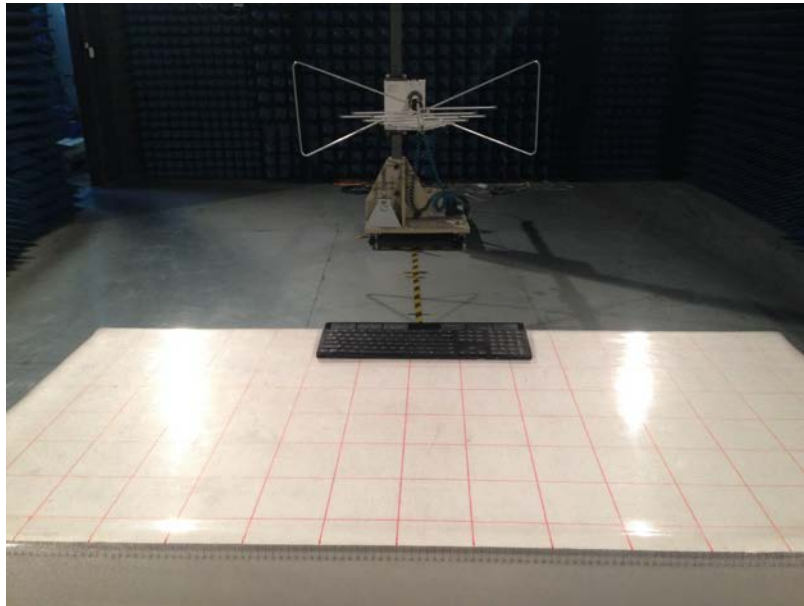
Middle channel



Highest channel

## 8 Test Setup Photo

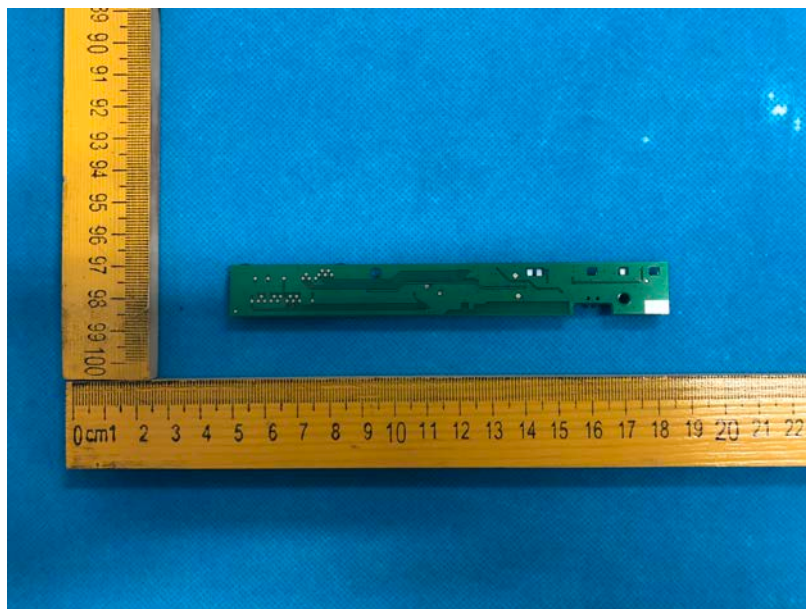
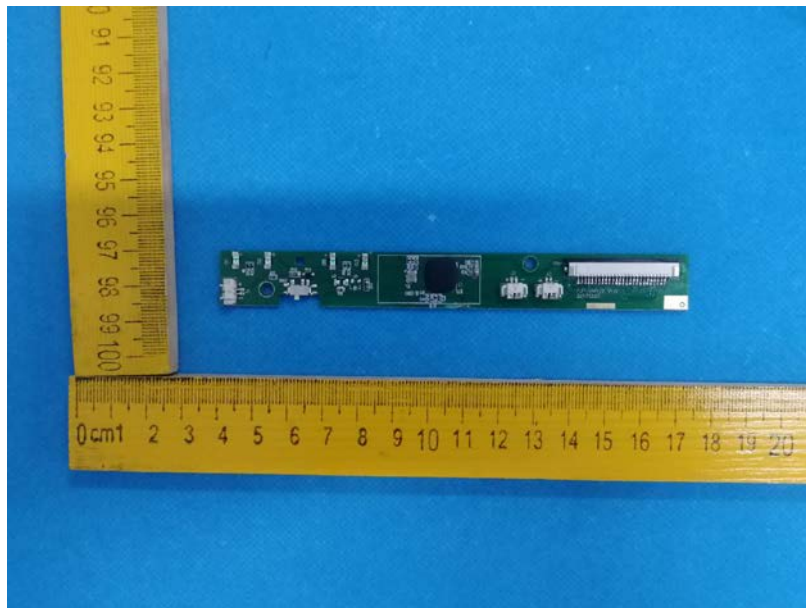
Radiated Emission

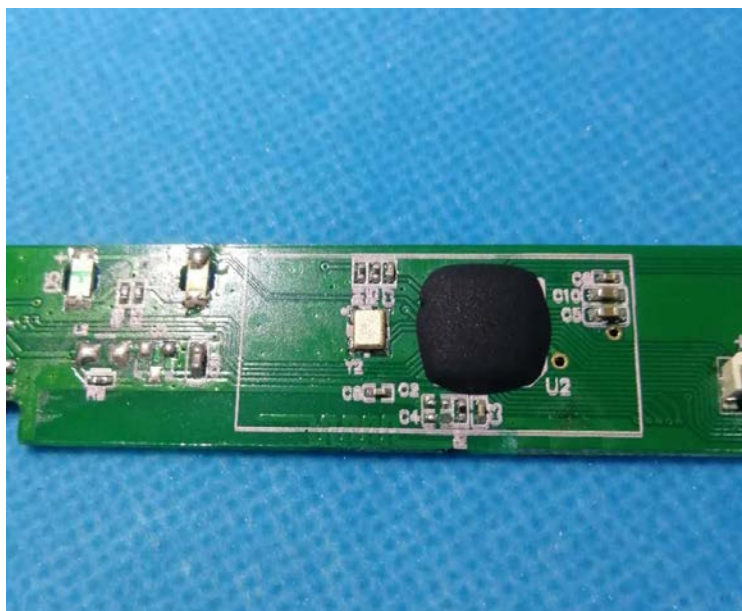


## 9 EUT Constructional Details









-----End-----